

We might instance the tapirs, swine, and some deer (all branches of the early trunk of the Ungulata), which in their youthful stages exhibit spotting, which afterwards is relatively effaced with increasing age.

Respecting Atavism, or Apparent Reversion, in the Equidæ, he refers to the ancestral dentition, to the five-toed ancestor, to occasional instances of cleft hoof, to at times a complete ulna in recent horses, as taking after the prototype of ancient equine forms. He instances *Protohippus* and *Hipparion*, the former as the ancestor of the breeds of horses, the latter as common ancestor of asses and zebras, without giving any decided data thereon*.

Reference is made to Mr. Bateson's † limits of reversion getting credit for things sufficiently accounted for by variation. Nevertheless, Prof. Ewart says:—"The heredity problem is sufficiently difficult as it is, but if we are debarred from invoking the assistance of the reversion hypothesis, it will become hopelessly incomprehensible."

In substance he most justly observes that preponderance is given to the colour of the dermal system in experiments as bearing on reversion, while habits and general structure only occupy the background. Notwithstanding this cautious advice the author himself has fallen into the trap, though he has endeavoured to relieve the situation by sundry brief notes on the tempers and habits of some of his hybrids. But the fact is, coloration, and especially zebrine stripes, can be reasonably compared, whereas temperament and, necessarily, habits are physiological factors of uncertain value on which to base comparison.

To sum up: whatever the ultimate result of Prof. Ewart's experiments, it would seem as if we had advanced a short stage in the matter of Telegony and Reversion, though some of his deductions doubtless will be questioned. The researches so far are still in the initial stage, but they are a stimulus, and it is to be hoped may be further pursued. Finally, where is the index?—a marked omission in this volume—for the brief table of contents does not help much where direct references on special points are needed.

MISCELLANEOUS.

On Ecdysis in Insects, considered as a means of Defence against Animal or Vegetable Parasites.—Special Rôles of the Tracheal and Intestinal Ecdyses. By J. KÜNCKEL D'HERCULAIS.

By the experiments made by us in Algeria for the purpose of endeavouring to infect young Acridians (migratory locusts) by means of spores of the fungus that we discovered upon the adults—the

* For an excellent epitome of 'The Horse,' his ancestors and living relations, clothed in most popular language, commend us to Flower's volume, with its reference to the palæontological and other literature of the Equidæ. Tegetmeier and Sutherland's 'Horses, Asses, Zebras, and Mules, and Mule Breeding' (1895) may also be profitably consulted.

† See his 'Materials for the Study of Variation,' 1894.

Lachnidium acridiorum, Giard—we ascertained that the repeated moults of these insects, which take place on an average once a week, are opposed to the fixation of the spores upon the integuments*. On the other hand, if we consider that it is often the stigmatic apertures that, in the adults, serve as a means of penetration for the spores, and if we remember that, after the spores have germinated, the ramifications of a thick mycelium block up the tracheal trunks, producing the phenomena of asphyxia †, we are obliged to recognize that, in the case of young Acridians, the casting off, with the integument, of the internal coat of the tracheæ is a serious obstacle to the preservation of the spores in the medium suitable for their germination.

In the course of the mission that we are accomplishing under the government of the Argentine Republic, we have been enabled to make observations which give a larger bearing to these preliminary remarks.

In drawing attention to the rôle of the pigments in the phenomena of histolysis and histogeny which accompany metamorphosis in the case of the migratory locust (*Schistocerca peregrina*, Olivier) ‡, we showed that after each ecdysis these Acridians excreted pigmentary matter with the fæces, which were thus found to be coloured pink, instead of remaining greenish brown as in the course of each of the stages of their development. In following very closely the development of the Paraná locust (*Schistocerca paranensis*, Burmeister), in order to see if we could not discover some peculiarity that might have escaped us, we have been led to examine the first excreta after the completion of metamorphosis; the result was that it was discovered that the fæces, like those of the African species, were charged with red pigmentary granulations. But this time, on pushing the analysis further, the microscopical examination showed us that these excreta were in reality a kind of sacs formed by the cuticle of the intestine. These sacs, immediately after being deposited, on being immersed in distilled water exhibited the most interesting peculiarities; from the very first they were seen to be inflated by large bubbles of air, which maintained them in suspension; these bubbles were nothing else than the remains of

* J. Künckel d'Herculais and Ch. Langlois, "Les Champignons parasites des Acridiens" (C. R. de la Soc. de Biol. 9^e sér. t. iii. p. 490, June 20, 1891; 'Comptes Rendus,' t. cxiii. p. 1465, June 22, 1891; Ann. de la Soc. ent. de Fr. t. lxi., 1891; Bull. t. cvi., June 24).

† A. Giard, "Observations sur les Champignons parasites de l'*Acridium peregrinum*" (C. R. de la Soc. Biol. 9^e sér. t. iii. p. 492, June 20, 1891); A. Giard, "Nouvelles Études sur le *Lachnidium acridiorum*, Giard, Champignon parasite du Criquet pèlerin" (Rev. gén. de Bot. t. iv. pp. 459, 460, 1892).

‡ J. Künckel d'Herculais, "Le Criquet pèlerin, *Schistocerca peregrina*, Olivier, et ses changements de Coloration. Rôle des Pigments dans les Phénomènes d'Histolyse et d'Histogénèse qui accompagnent la Métamorphose" (Comptes rendus de la Société de Biologie, 9^e série, t. iv. p. 56, 1892; Comptes Rendus, t. cxiv. p. 240, February 1, 1892; Annales de la Société entomologique de France, t. lxii. Bulletin, p. 25, 1892).

the masses of air which fill the digestive tract in order to enable the metamorphosis to take place, as we have shown by our previous studies *; moreover, in the midst of the granulations resulting from the histolysis of the tissues and of the granulations of reabsorbed pigment, there were soon perceived a number of Gregarines. Thus, then, these Protozoa were got rid of like waste matter, in the same way as the products of histolysis. From this we may understand that each moult not only occasions the regeneration of the normal tissues, but that it also results in freeing the organism from the parasites which cause the denutrition of these tissues.

From these facts is to be deduced a series of results, some of which are physiological, while the others are of an essentially practical order. In fact if the observers, and this particularly applies to M. Louis Léger †, who have sought for Gregarinae in the digestive tract of Acridians did not succeed in meeting with these parasites in the case of migratory locusts, while they found them in species belonging to the same group, the reason was that the locusts in question had rid themselves of the parasites by shedding their intestinal cuticle; between the ecdyses they abound in the Paraná locust; they diminish in number after each ecdysis ‡. On the other hand, everyone is aware that in Europe (in Russia, France, and other countries), in Africa (Algeria, Cape of Good Hope), as also in America (United States, Argentine Republic), great hopes have been founded upon certain parasitic organisms (fungi, bacilli, Protozoa) for arresting the multiplication of destructive insects, and especially of migratory locusts. But we see from these observations that these insects with rapid development are in possession of a very simple means of ridding themselves from these organisms, in being able to regenerate themselves at each stage of their development. Thus we are able to understand the resistance that, *under the conditions of normal existence*, insects are capable of offering to the contamination or disorganizing action of vegetable or animal parasites.—*Comptes Rendus*, t. cxxviii. no. 10 (March 6, 1899), pp. 620-622.

* J. Künckel d'Herculais, "Du rôle de l'Air dans le Mécanisme physiologique de l'Éclosion, des Mues, et de la Métamorphose chez les Insectes orthoptères de la Famille des Acridides" (*Comptes Rendus*, t. cx. p. 107, 1890).

† Louis Léger, "Sur une Grégarine nouvelle des Acridiens d'Algérie" (*Comptes Rendus*, t. cxvii., Dec. 4, 1893).

‡ This Gregarine belongs to the genus *Clepsidrina*, Hammerschmidt, and we shall term it *Clepsidrina paranensis*, for the double purpose of recalling the fact that it is found in the country watered by the Paraná, and that it infests *Schistocerca paranensis*, the migratory locust of South America. It is probable that it also inhabits the digestive tract of other species of Acridians. Although it attains the size of *Clepsidrina acridiorum*, Léger, and though its deutomerite is consequently four times larger than its protomerite, it differs in the general shape of the deutomerite, which is ellipsoidal instead of being cylindrical, and in the coloration of the granulations of the endocyte, which are not tinged with reddish yellow, but are of a uniform yellowish white.